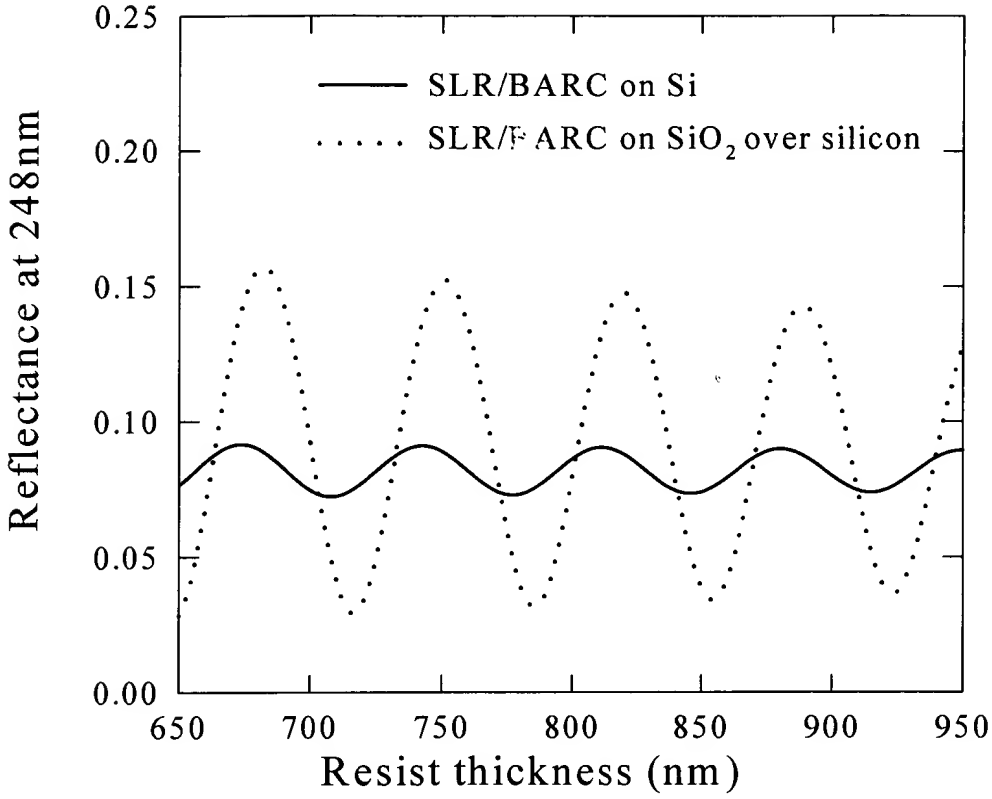
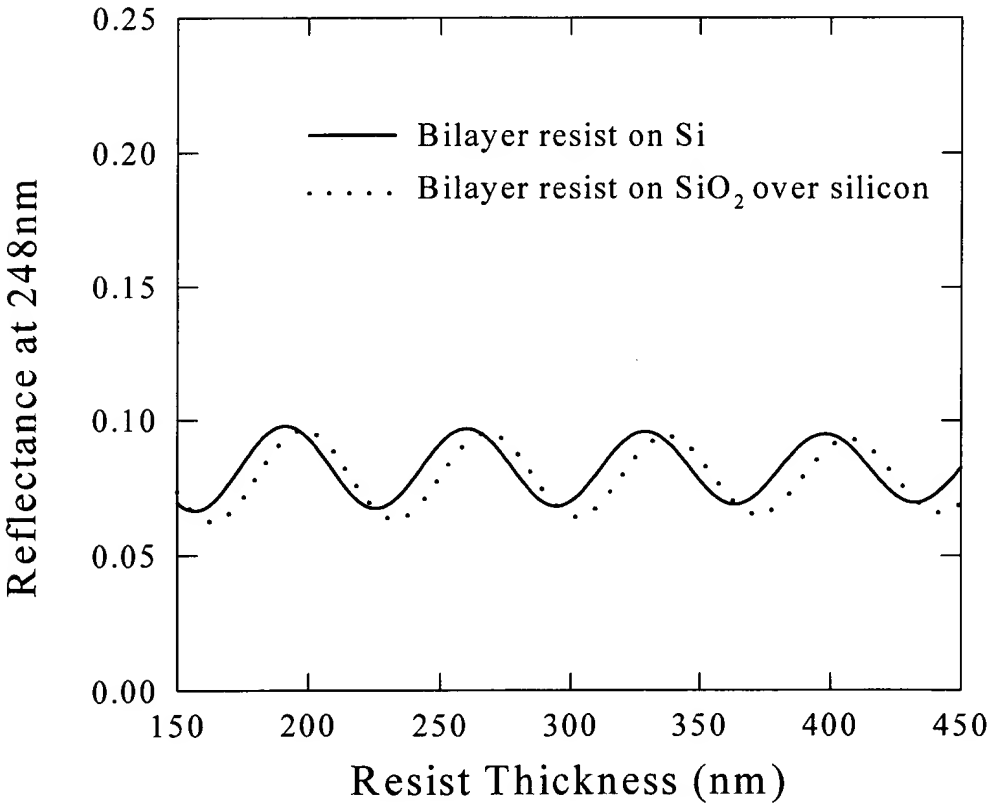


(a)

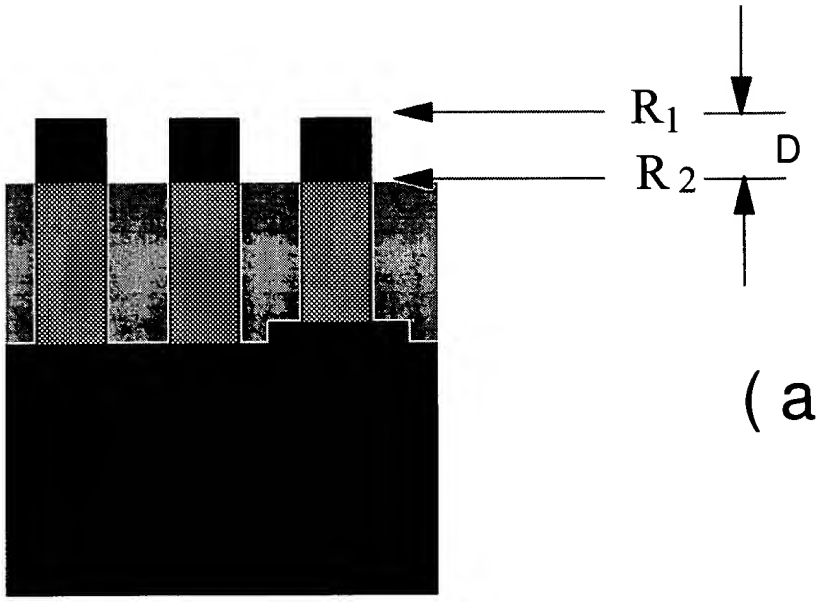


(b)

(a) Swing curve of SLR on BARC, (b) Swing curve of bilayer resist

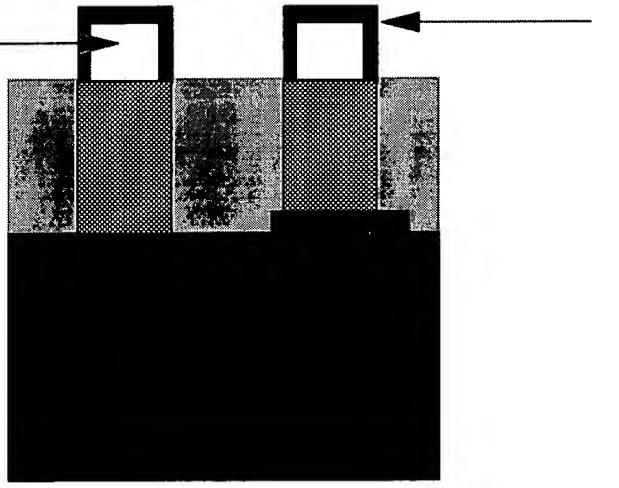
Fig. 1

Bi-layer resist scheme



(a)

Top surface imaging (silylation reaction) scheme



(b)

$$S \cong 4\sqrt{R_1 R_2} \cdot e^{-\alpha D} \qquad (c)$$

R_1 - Reflectivity at top resist/air interface at 248nm

R_2 - Reflectivity at underlayer/top resist interface at 248nm

Fig. 2

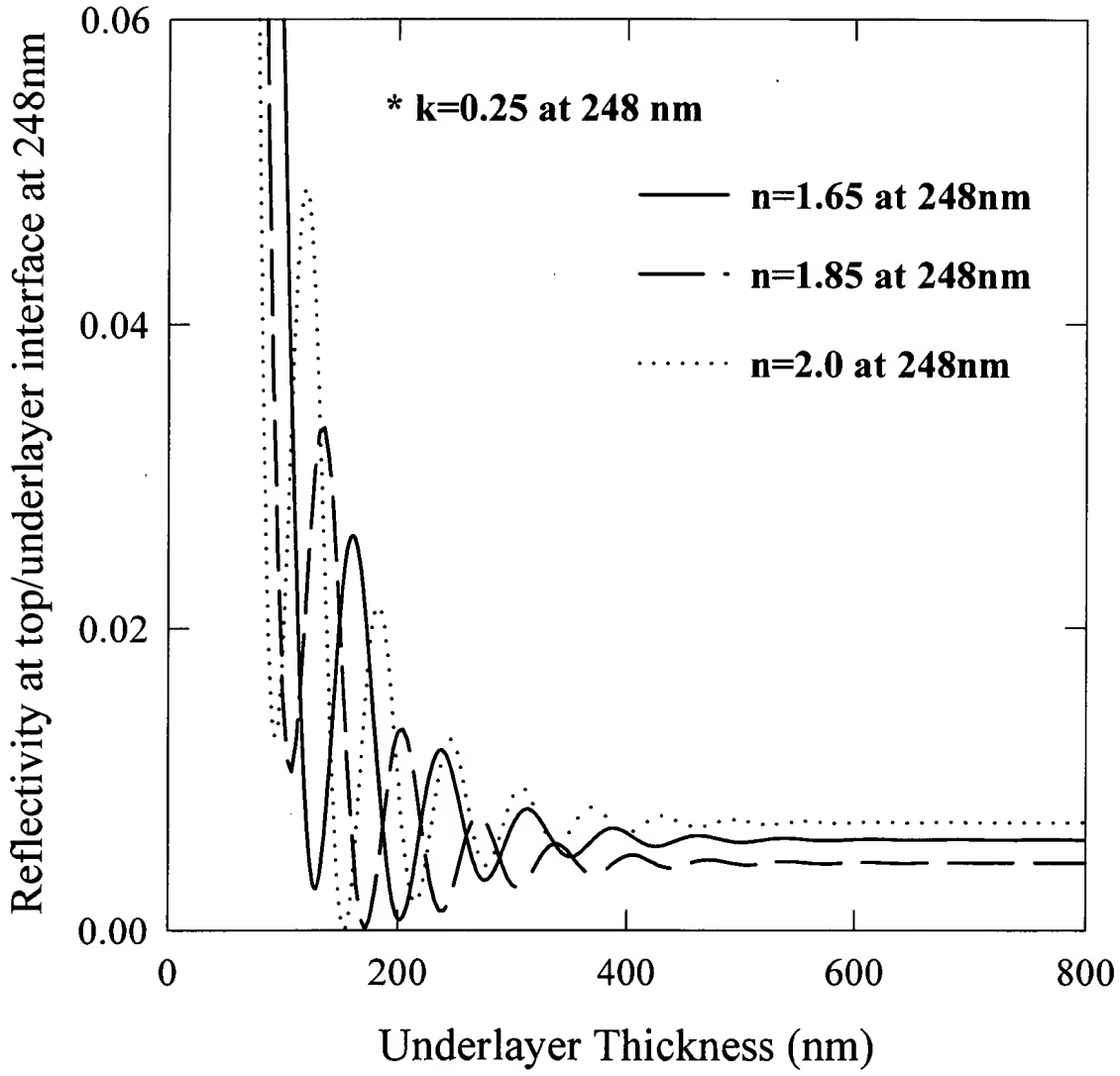

0.06
0.04
0.02
0.00
0
200
400
600
800
Reflectivity at top/underlayer interface at 248nm
Underlayer Thickness (nm)
* k=0.25 at 248 nm
n=1.65 at 248nm
n=1.85 at 248nm
n=2.0 at 248nm

Fig. 3

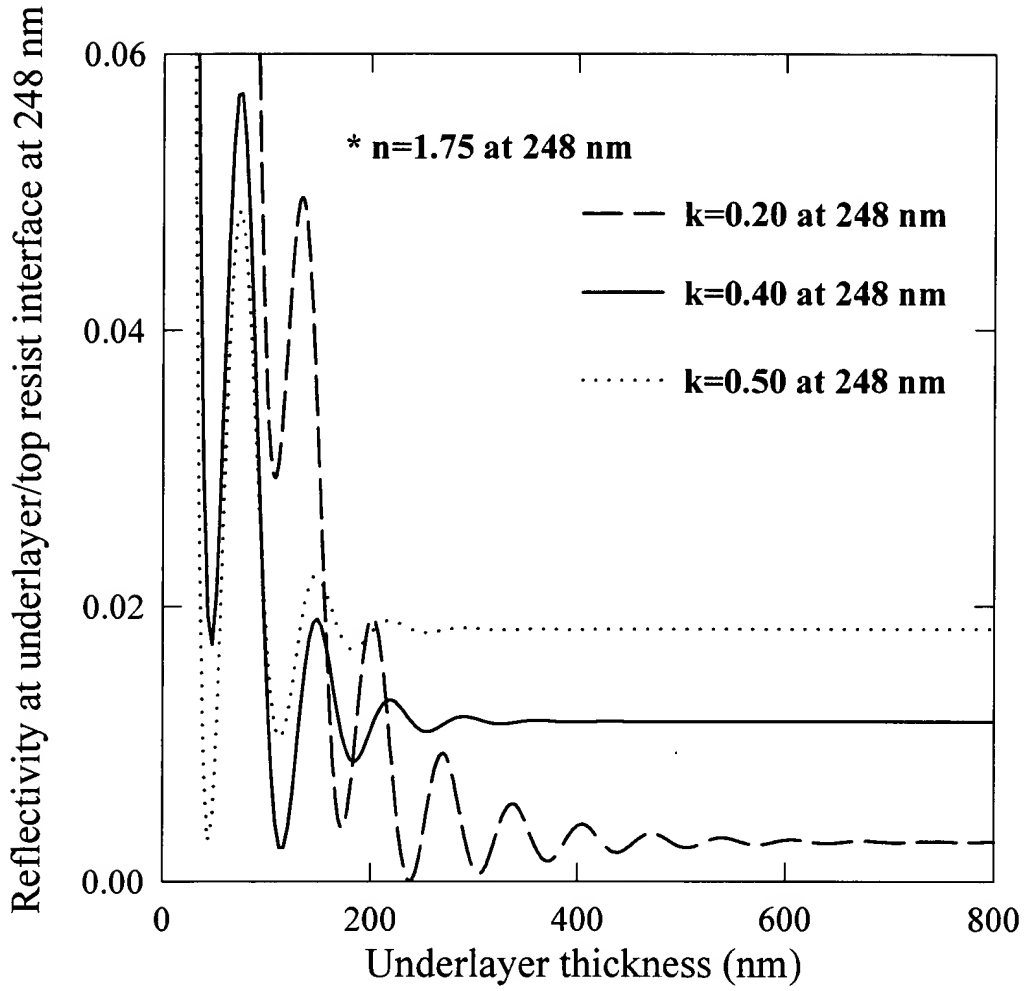

Reflectivity at underlayer/top resist interface at 248 nm
0.06
0.04
0.02
0.00
0
200
400
600
800
Underlayer thickness (nm)
* n=1.75 at 248 nm
k=0.20 at 248 nm
k=0.40 at 248 nm
k=0.50 at 248 nm

Fig. 4

Report from n&k Analyzer 1[redacted]

Time & Date: 13:48:07 , 02-11-1999
Lot Id : G1
Sample Id : 2500rpm, 120/30+250/180
Position Id:
Operator : Katya
Comments :
Data : R = C:\DATA\KATYA\1998\UNDER_L\g1_250180.dat
T = None
Goodness of Fit = 0.0029 Eg(V) = 2.78eV
Hydrogen content = 48.3 %

WL(nm)	193	248	365	633
n	1.603	1.869	1.740	1.663
k	0.527	0.223	0.074	0.005
Rexp	0.09	0.10	0.07	0.32
Rcalc	0.09	0.10	0.07	0.32

Film Structure

	Interface Roughness	Thickness
0 A (F) ->		
0 A (F) ->	unknown	7630 A
	Si Substrate	1.00 mm (F)

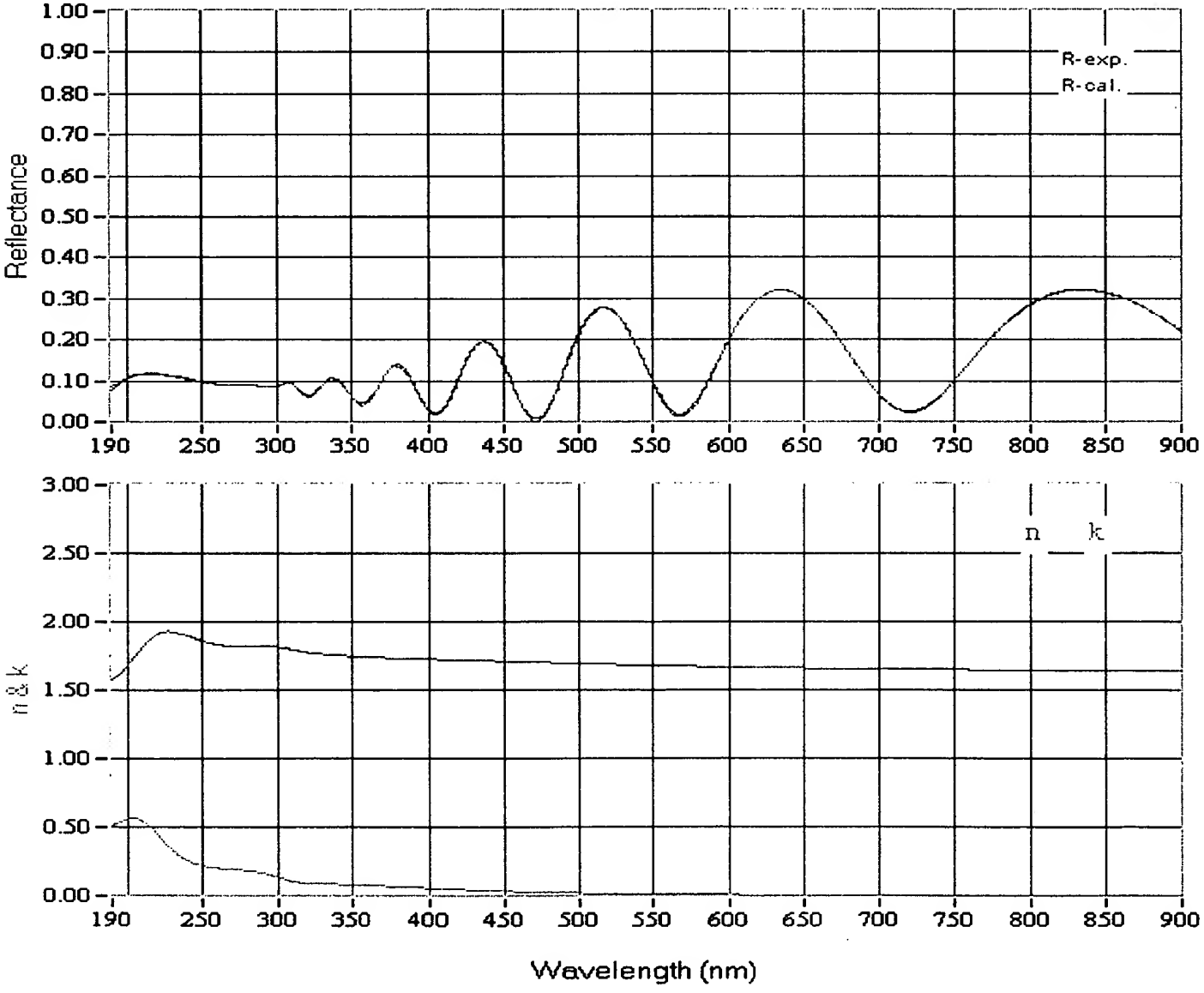


Fig. 5

Report from n&k Analyzer 1.0

Time & Date: 13:55:27 , 02-11-1999
Lot Id : Barl
Sample Id : MTI 230/4 min
Position Id:
Operator : Katya
Comments :
Data : R = C:\DATA\KATYA_OL\BOTTOM\Barl_mti.dat
T = None
Goodness of Fit = 0.0052 Eg(V) = 4.14eV
Hydrogen content = 49.8 %

WL(nm)	193	248	365	633
n	2.314	1.829	1.692	1.603
k	0.199	0.165	0.001	0.001
Rexp	0.14	0.09	0.40	0.13
Rcalc	0.16	0.09	0.42	0.13

Film Structure

	Interface Roughness	Thickness
0 A (F) ->		
0 A (F) -> untnown		7214 A
Si Substrate		1.00 mm (F)

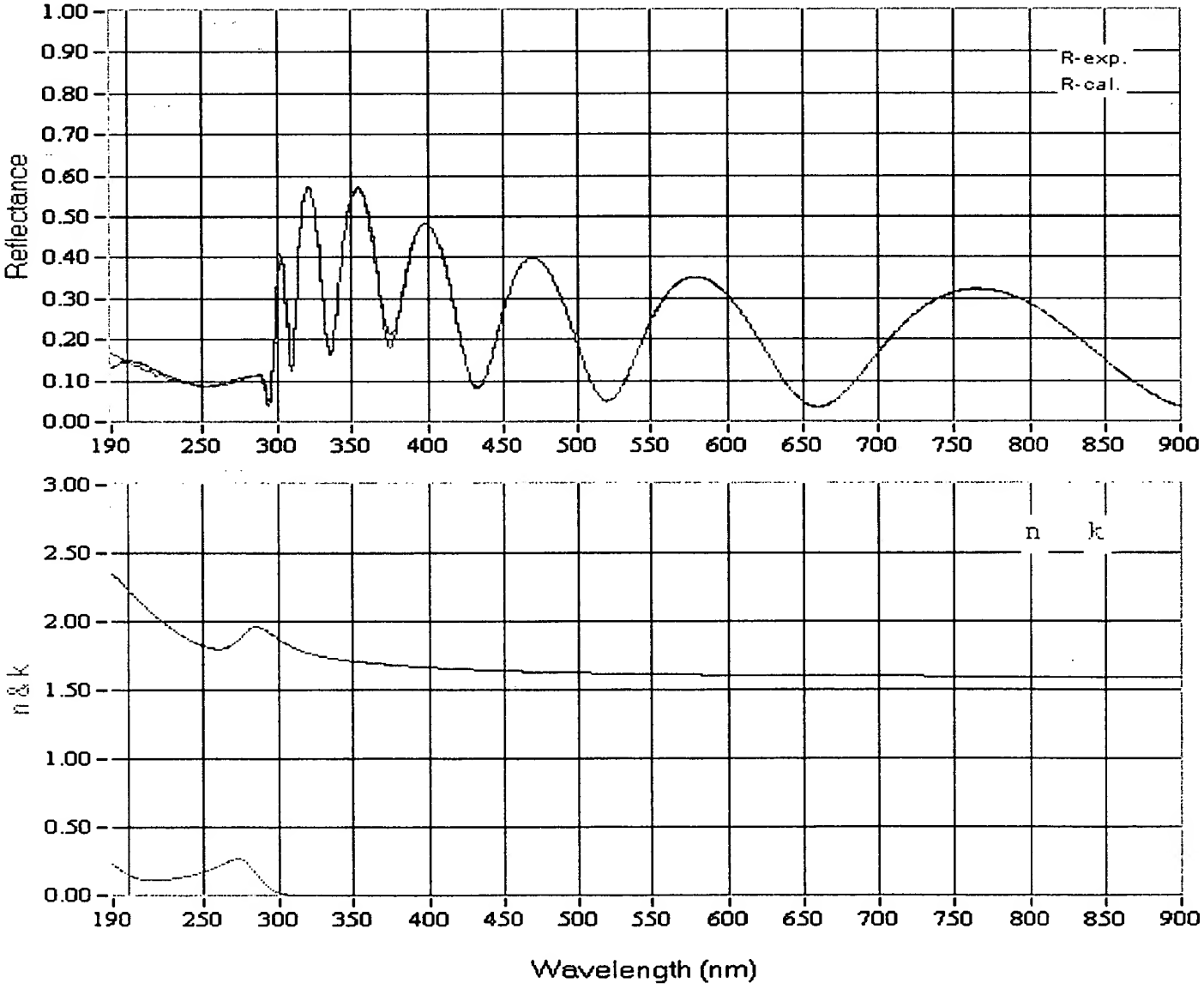


Fig. 6

Report from n&k Analyzer 1[redacted]

Time & Date: 13:34:03 , 02-11-1999
Lot Id : E2ZA
Sample Id : kb121198_1 (15)
Position Id: 3000rpm, 120/30+155/120
Operator : Katya
Comments : center
Data : R = C:\DATA\KATYA\1998\UNDER_L\e2za.dat
T = None
Goodness of Fit = 0.0064 Eg(V) = 4.10eV
Hydrogen content = 49.9 %

WL(nm)	193	248	365	633
n	1.904	1.750	1.712	1.647
k	0.777	0.193	0.042	0.000
Rexp	0.15	0.07	0.20	0.32
Rcalc	0.16	0.08	0.20	0.33

Film Structure

Interface Roughness Thickness

0A (F) ->
0A (F) -> unknown ?
Si 1.00 mm (F)
Substrate

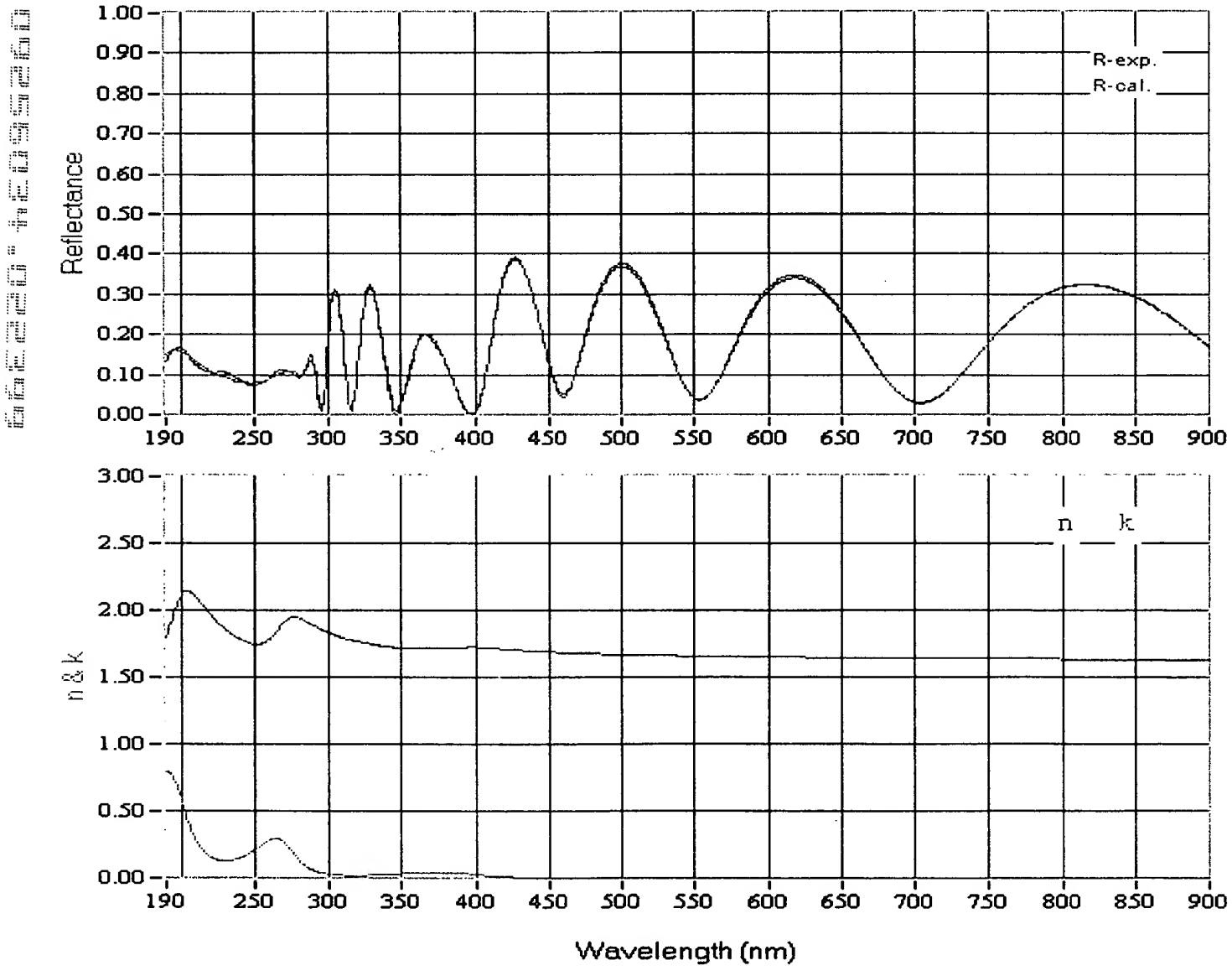
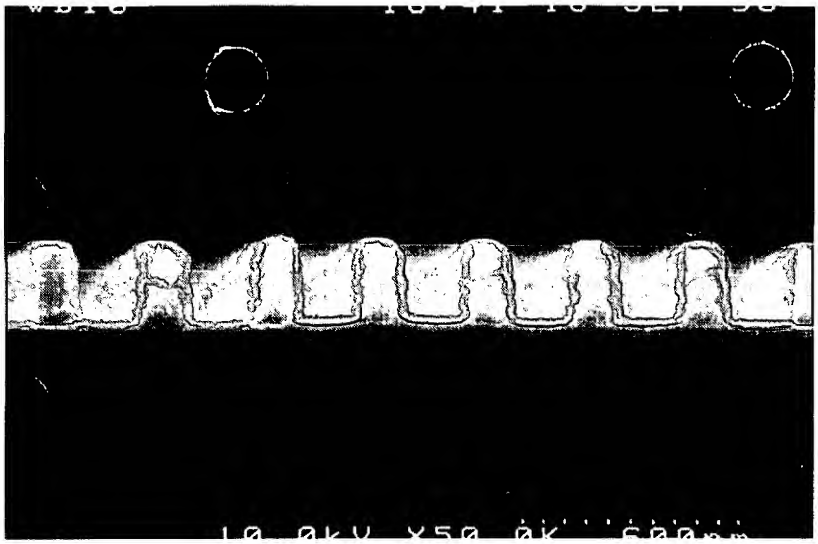
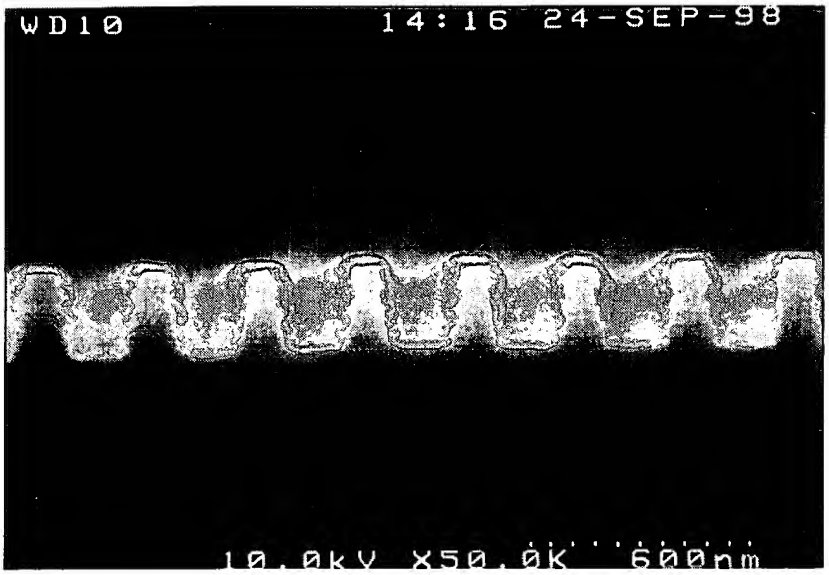


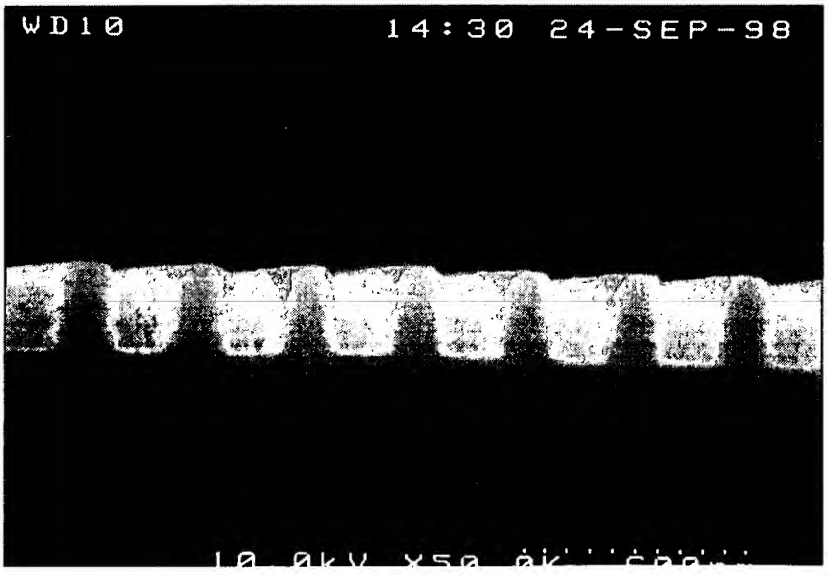
Fig. 7



novolak underlayer with k=0.20 at 248nm

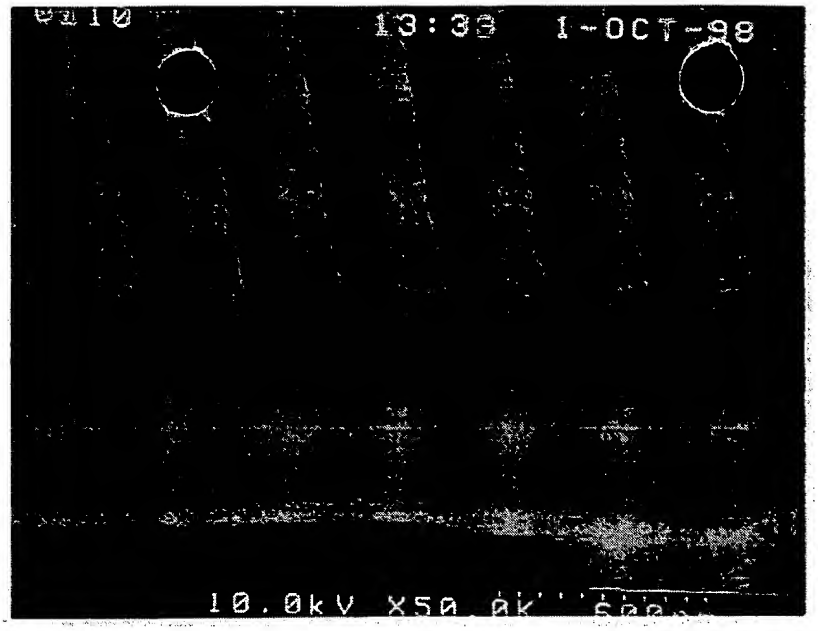


novolak underlayer with k=0.35 at 248nm

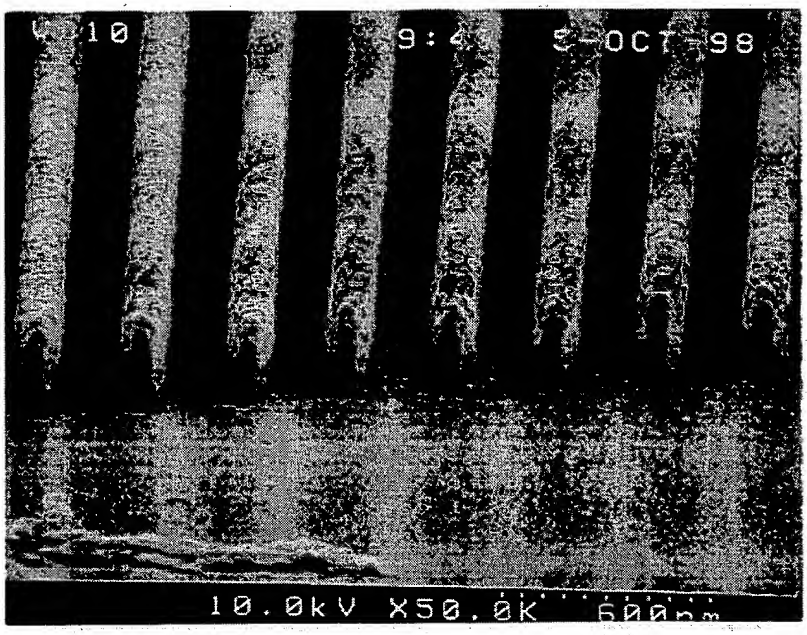


novolak underlayer with k=0.08 at 248nm

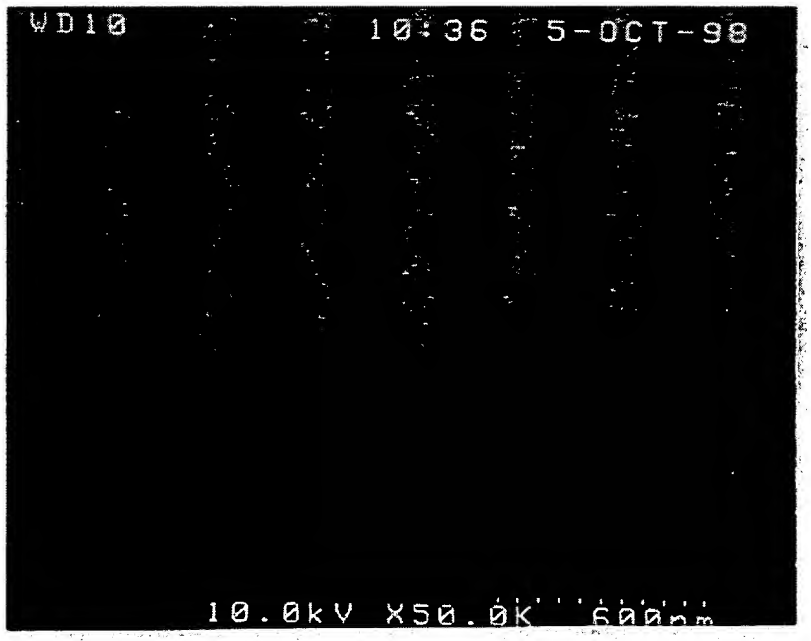
Fig. 8


WD10
13:33 1-OCT-98
10.0kV X50.0k 600nm

(a)


WD10
9:4 5-OCT-98
10.0kV X50.0k 600nm

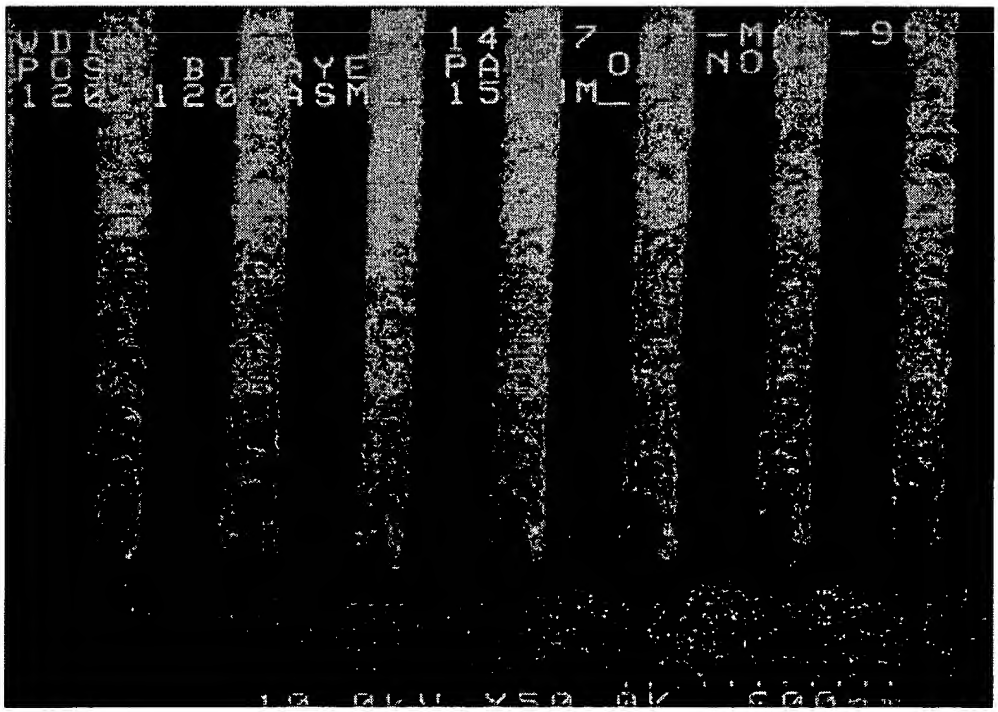
(b)


WD10
10:36 5-OCT-98
10.0kV X50.0k 600nm

(c)

Fig. 9

(a)



(b)

Fig. 10

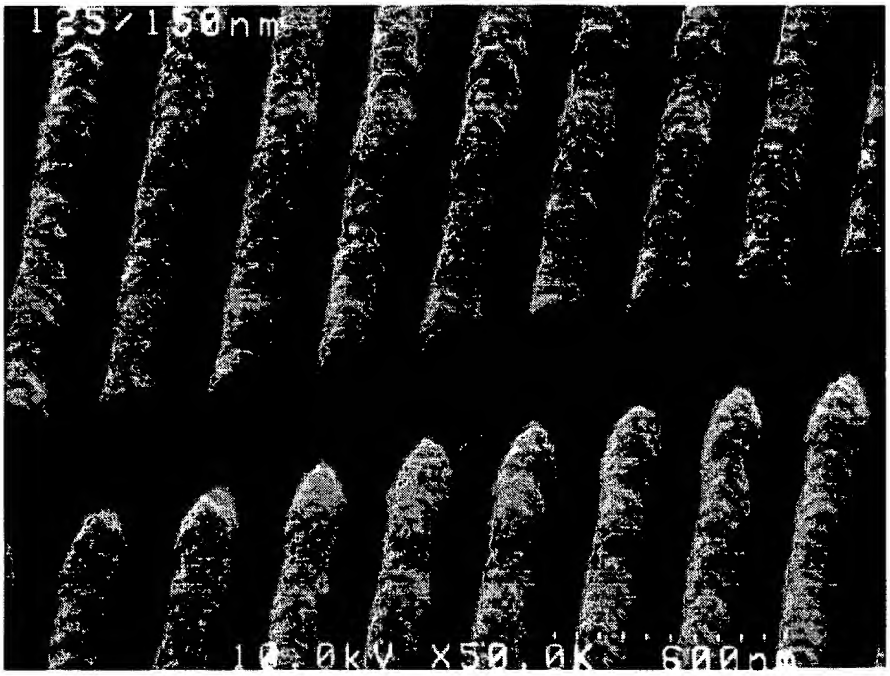
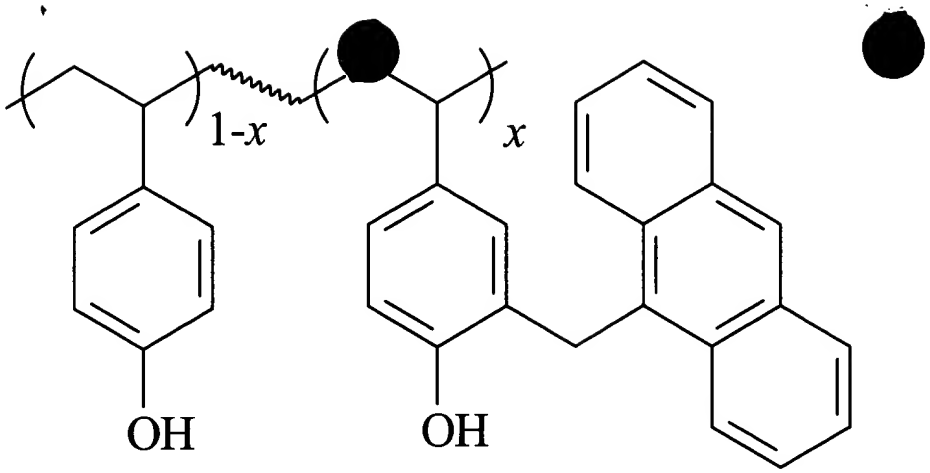
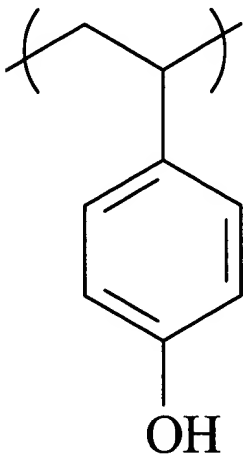


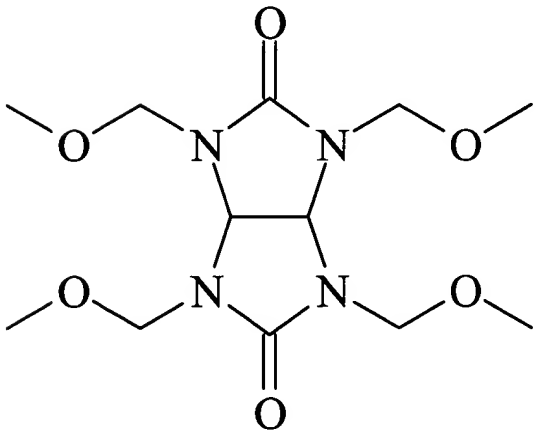
Fig. 11



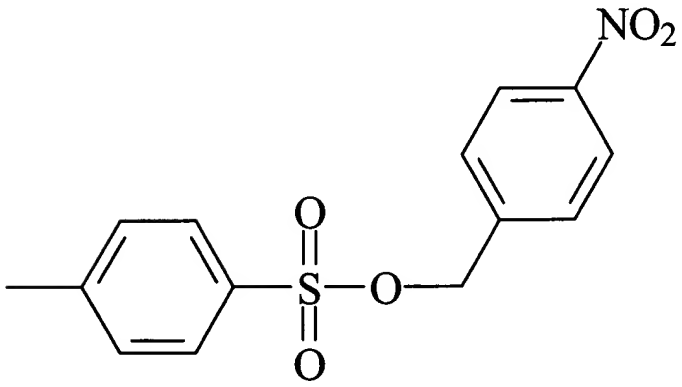
(a)



(b)



(c)



(d)

Fig. 12

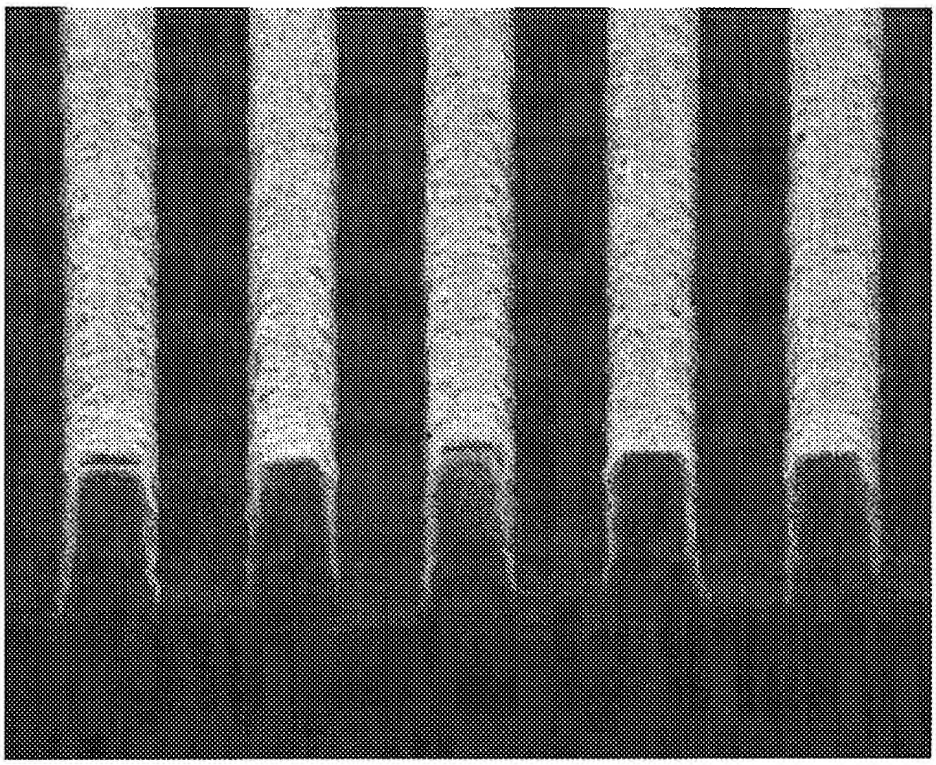


Fig. 13

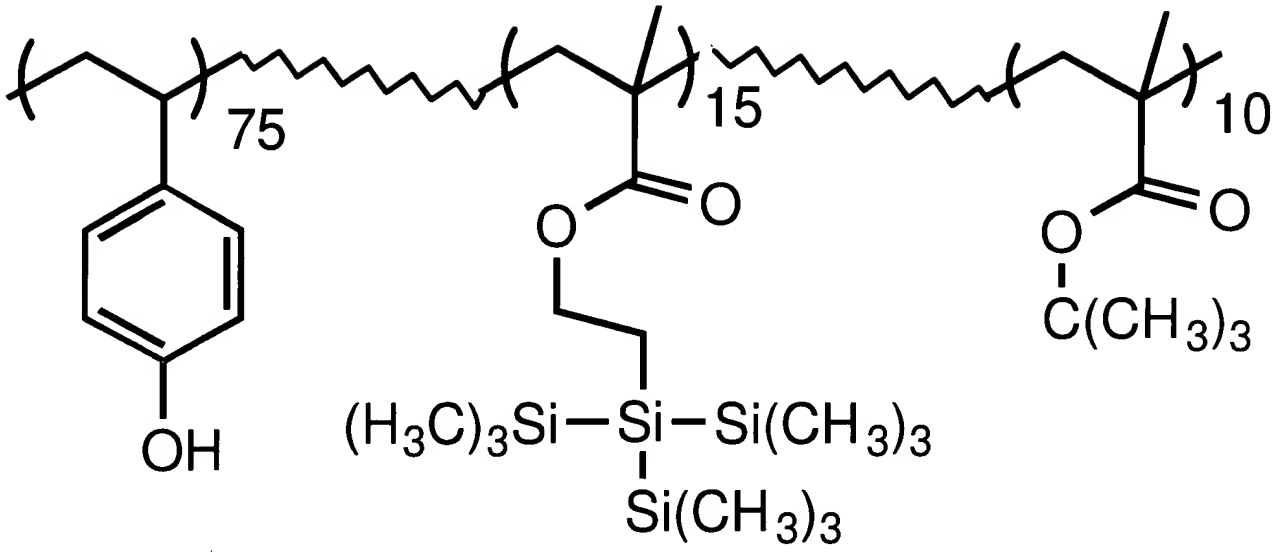


Fig. 14